Dec 5, 1966

NOTES 12/5/66 BALCH 12/5/66 B 12/7

S-II-1 Testing - Shortly after midnight on 12/1/66, a full-duration static firing was conducted. Preliminary indications are that all major test objectives were met, and there were no malfunctions that would have prevented the stage from performing a successful flight mission. There was no evidence of significant leakage at either the LH_2 tank outlet elbows or the aft LOX tank bulkhead doublers. Engine position 1 and 4 could not be gimballed because of malfunction of the Side Load Arresting Mechanism (SLAM) system. This problem has been defined, and the necessary corrective action is being taken. There was major damage to the LH_2 outlet purge channels and to the LH_2 forward bulkhead membrane seal. The major constraint to the second static firing is apparently the repairs to the LH_2 outlet purge channels. Estimated time for these repairs is 12 to 20 days. Earliest date for second firing is 12/20/66. ✓

S-IC and S-II A-1 Test Stands - Latest assessment of the impact of recent labor troubles on S-IC B-2 and S-II A-1 activation schedules indicates a slippage of at least 18 days will be incurred. ✓

S-IC-T Activities - Discrepancies identified in the electrical and mechanical checkout of the stage are being dispositioned and worked off. One of the R-Qual personnel will be retained until this is completed. In the electrical checkout with the Brooks Analyzer, only 4 cable replacements were found to be necessary out of a total of 254 checked, and most of the discrepancies identified in the mechanical check were relatively minor. Present planning calls for placing the S-IC-T in the B-2 stand on 12/19/66. ✓

Labor Troubles - Currently, there are no workers out because of labor disputes. With reference to your comments on my "Notes" dated 11/21/66, the Koppers Company did not consult with NASA prior to firing the IUOE members who were not working, but Koppers was not under any obligation to do this, being responsive only to the Corps of Engineers in matters of contract administration. NASA Labor Relations would not have been in a position to advise against the firing of the IUOE members because the action appeared to be justified. In this particular instance, the IUOE members refused to work in an attempt to force Koppers to rehire an IUOE member who had on 11/16/66, provoked an altercation with a member of the Pipefitters Union by willfully destroying certain company property. ✓

Hugh L. Dryden Memorial Fund Campaign - In accordance with your memorandum dated 11/18/66, each NASA employee at MTF was given an opportunity to contribute to this fund. A total of 75 out of 100 on-board contributed. ✓

NOTES 12/5/66 BELEW

12/5 ONS

B 12/7

AIRLOCK MOCKUP: A hard mockup of the Oribital Workshop Airlock was ordered for the McDonnell Company through MSC. A March 1, 1966 delivery date is anticipated.

NEUTRAL BUOYANCY TESTING: Astronaut Lt. Comdr. Alan Bean was at MSFC Tuesday, for the purpose of conducting a number of tests in the neutral buoyancy facility. Comdr. Bean requested this visit in order to familiarize himself with the underwater testing program.

DOD D021 MOCKUP EXPANDABLE AIRLOCK EXPERIMENT: Soft mockup for stowed and deployed configuration of D021 has been received from Wright-Patterson AFB. These mockups will be used for MSFC integration efforts for DOD experiment.

IN-FLIGHT EXPERIMENTERS' MEETING: The 8th In-flight Experimenters' Meeting was held at Cocoa Beach, Florida, on November 30, and December 1 and 2. The meeting, chaired by Dr. Jocelyn R. Gill of OSSA, emphasized (1) completion of the Gemini Program experiments, (2) commencement of the Apollo Earth Orbital experiments, and (3) contamination problems. The Gemini experiments were grouped as follows: 17 scientific, 8 medical, 17 technological, and 10 Apollo support, for a total of 52.

CONTROL MOMENT GYRO (CMG): The CMG Procurement Plan was approved by NASA Headquarters on November 28, 1966. The RFP has been handcarried to Bendix and a proposal is expected on or before December 12. It is expected that contract negotiations and subsequent Headquarters approval of contract will take until mid-January. It is planned to request approval for limited Bendix go-ahead immediately.

ATM EXPERIMENT PACKAGE DIAMETER: The decision has been made to expand the ATM experiment package diameter from 65 inches to 82 inches, or as close to that as possible. P&VE is proceeding with the rack layout to see if this increase can be made to fit. The increase is required to accommodate the growing contingent of experiment hardware.

SATURN APOLLO APPLICATION MISSION "A"-1 (LUNAR MAPPING AND SURVEY SYSTEM): We met with representatives of the Manned Space Flight Center and the Air Force last week to discuss the feasibility of transferring the Lunar Mapping and Survey System from the 120 nautical "check-out" orbit to the 270 nautical mile orbital workshop orbit for the purpose of attaching the LM&SS to the orbital workshop. Sufficient payload is available to permit the transfer to the higher orbit as well as addition of a limited earth sensing experiment (EO-Zero). The Manned Space Flight Center estimated the cost of three to five million dollars for adding EO-Zero Experiments, hardware and for carrying the rack and EO-Zero experiments to the higher orbit. This cost does not include the impact of modifying the LM&SS payload module for re-use. The Air Force program office is investigating the feasibility and the desirability of modifying the payload module for re-use.

NOTES 12-5-66 BROWN

12/5958

B 12/7

H-1 ENGINE With reference to H-1 notes of 11-14-66, which reported that teflon was found inside the LOX portion of the injector of Engine H-7080 at Michoud; the source of the teflon has been isolated to stage propellant supply (wrap around) ducts supplied to CCSD by SOLAR aircraft. The investigation team recommended by Dr. Rees to investigate areas in the engine and stage is being formed under the chairmanship of Mr. E. Mintz, R-QUAL-J. It is our understanding that they will start at Michoud and proceed to Neosho.

As reported in the 11-30-66 Flash Report, the turbine blades that failed in Engine H-4078 (S-IB-208) were made from 316 stainless steel rather than Haynes Stellite 21. Investigation into the validity of examining existing X-rays to determine which engines may have blades of the wrong material is encouraging. H-1, Atlas, and Thor engines are involved. A total of 534 wheel X-rays have been examined, and 23 of these have mixed blades. Six of the 23 wheels have been traced to H-1 engines, five are in Atlas sustainer engines and the other twelve are still being traced. X-rays from S-IB-204 have been inspected and no discrepant blades were noted.

The H-1 engines with discrepant blades that have been identified to date are:

	Engine Nr.	Stage	Nr. Discrepant Blades
H-1	4073	S-IB-207	5
	7078	207	3
	4077	208	33
	4078	208	42
	7085	208	1
	7092	210	2

The discrepant blades seem to have been delivered in an approximate six month period ending in December 1964. There are many more X-rays to inspect and we might find more H-1 engines involved. These incidents certainly raise questions as to the validity of discontinuing vehicle static tests.

In response to your question on the TWX attached to the Heimburg notes of 11-21-66 regarding our appraisal of the high breakaway torque noted on a number of H-1 engines, a review of the total circumstances indicated a breakdown in communications--not a deficiency in the criteria for disassembly of turbines. Neither CCSD, the S-IB project office nor the H-1 project was fully appraised of all that was found before the first static firing of S-IB-8. Consequently no one, including R-TEST, raised objections to the first static test, at or after meetings on this subject several days before the test.

GENERAL In view of the findings at this time on the material discrepancy found in the H-1 Turbine blades a detail review is also being made on the J-2 and F-1, whose blades are also made at the Haynes Stellite plant at Kokomo, Indiana.

NOTES 12/5/66 CONSTAN

12/5 FS

B 12/7

S-IB

Cracked Solder Joints - CCSD was advised that certain printed circuit cards in the PCM/DDAS telemetering unit were discovered to have cracked solder joints. Primarily, this occurred on other stage contractors' units. These cracked solder joints could possible cause a loss of telemetry flight data. CCSD feels that they do not have a problem in this area based on past performance and inspection of various printed circuit cards. However, CCSD has stated that they would reinspect the spare PCM/DDAS unit supporting S-IB-4 at KSC, to insure that they do not have a problem. Subsequent to this inspection and/or repair in case cracked solder joints are discovered, this unit will replace the flight unit presently installed on S-IB-4. Any further inscope contractual effort by CCSD will be dependent upon this inspection.

S-IC

S-IC-3 - The stage is undergoing refurbishment at Michoud following successful static firing at MSFC.

S-IC-4 - 60B----21 Pressure switch delivery from vendor is temporarily delaying attempt to complete SST. The milestone date for this test is December 28, 1966.

S-IC-5 - All five engines have been installed and component assembly is progressing on schedule.

S-IC-6 - Thrust structure, fuel tank, and intertank have been assembled in the VAB. The LOX tank has been painted and will be installed on the intertank Monday, December 5, 1966. The forward skirt is complete and is scheduled for assembly on the LOX tank Tuesday, December 6, 1966.

NOTES 12/5/66 FELLOWS

12/5/66

B 12-7

1. Assignment of Project Management Personnel to Advanced Systems Office (ASO) for Specified Projects: Frank Williams, Bob Pace (IO), and representatives of my office have prepared a draft IO/R&DO agreement which stipulates the parameters and considerations under which project management personnel can be assigned to selected promising projects in Frank Williams' office. This agreement contains an arrangement so that project management thinking can be injected into advanced projects during their early phases; will provide for some technical refreshment of project management people; and will provide for management and technical continuity on through the development phases of projects which have been implemented under this arrangement by mutual agreement of R&DO and IO.

2. MSFC Assistance for S-II Stage Component Testing: R&DO reviewed a proposal from the S-II Stage Project Office that MSFC perform 15 tests of S-II stage components to assist in completion of the S-II stage qualification test program. R&DO can perform three (S-II-1 LH_2 Steel Elbow, S-II Thrust Structure, and S-II Stage to Engine Thrust Pad Bolts) of the tests within present schedules, provided early go-ahead is received from the S-II Stage Project Office. One additional test (LOX Tank Pressurization System) can be performed by R&DO with a slip of the current S&ID schedule. The 11 remaining tests are either not feasible for R&DO to perform (interference with the tests we can do) or not possible because of lack of proper test equipment at MSFC. The S-II Stage Project Office has been informed of this testing analysis by memorandum dated November 28, 1966.

NOTES 12/5/66 GEISSLER 12/5/66 B 12/7

1. Saturn V EDS: Reference your comments on this subject in Notes 11/14/66 Geissler, copy attached. EDS concepts have been developed primarily based on detailed numerical applications for Saturn IB. Certain preliminary studies for Saturn V indicated that the situation might get a little more difficult, but it was hoped that further detailed studies would produce an acceptable situation. Differences between IB and Saturn V consist primarily of (1) Aerodynamic characteristics - Saturn V has less stability; (2) Saturn V will use no acceleration term in its control system (this feature was eliminated about one year ago in order to relieve Astrionics' workload in view of the small load relief obtained and adequate structural strength indicated at that time); (3) The Saturn V engines have no cant angle (like IB). (Engine out was originally not considered because of large performance degradation.

More recent data received on non-linear aerodynamics and structural capabilities have shifted the situation from marginal to insufficient. Our latest structural data have been reconfirmed by P&VE and we are still analyzing some of the failure modes. Elimination of mission continuation with one engine out appears necessary, and automatic abort for engine out may be mandatory for certain time periods during S-IC flight phase. We hope to be able to report in more detail about 3 weeks from now.

Please do B →

2. Odyssey: This proposed experiment (Orbital Dynamics of Spherical Satellites Experimentally) is an accurately tracked (Smithsonian's Baker-Nunn Cameras) set of three spheres (0.2, 0.6 and 1 meter diameter) which is to be injected into a low perigee (160 Km) high apogee (1750 Km) orbit to determine atmospheric density, free molecular and transitional drag coefficients, and certain other aspects of geodesy. The experiment appears attractive to the Saturn Apollo Applications Office due to (1) its potential scientific results, (2) no astronaut requirements, (3) no power requirements, and (4) its moderate cost. We have done sufficient work on orbits, separations, error analyses and lifetime studies to enable Dr. Lundquist, the co-investigator, to agree on these parameters. (Messrs J. Ballance & R. Smith of AERO are principal investigators). Our studies are based on carrying this 5000# payload in the SA 212 LM laboratory flight. Paperwork requesting $200,000 for phases B and C of the contract has been submitted to the Experiments Office. Final guideline data should be available in time to brief prospective contractors, or initiate hardware studies inhouse if necessary. Upon completion of the contract for phases B and C, the experiment will be presented to the MSFEB in Washington.

3. Voyager Load Relief Control Studies: On Wednesday, November 30, representatives of R-ASTR and R-AERO met with Honeywell personnel to discuss progress on the study of Voyager load relief control. Results to date indicate that by using the proposed load relief control system, bending moments are reduced more than the 40% reduction we reported to you in our August 30 Voyager presentation. This reduction in load may not be available for other AAP configurations or may require different approaches depending on the individual mass distribution.

NOTES 12-5-66 CRAU

12/5 9PM

B 12/7

1. S-IC-2 CHECKOUT: Several missing components have been installed and checkout of the S-IC-2 stage continues. Present evaluations show mechanical tests approximately 90 per cent complete. Networks and guidance tests are complete except for simulated flight tests which have been delayed due to retests required in the instrumentation and telemetry area. Retests were required due to removal and inspection of the TM multiplexers. Release date of the stage to Manufacturing Engineering Laboratory is now estimated to be December 14, 1966.

2. F-1 ENGINE PROGRAM: A review of the hardware of the qualified F-1 Engine was held at Rocketdyne on November 28-29. The qualification engine (F-2037) was completely disassembled and displayed for all personnel participating in the qualification review. It is notable that no mandatory changes to F-1 hardware resulted from the qualification test program. However, several product improvement type changes will be made to hardware and seals, including a review directed toward improvement of quality control associated with the handling and storing of seals.

3. SECOND NASA-WIDE RELIABILITY AND QUALITY ASSURANCE MEETING: Last week I attended the above meeting in Washington. While in the first one which took place in February 1965, there were still several Centers which had reservations to follow the established NASA Quality Assurance & Reliability guidelines (such as NPC 200-1, 2, 3 and NPC 250-1). It is noteworthy that now all Centers follow the intent of these guidelines and are pleased with the results. For the Scout project it was presented that the success ratio which lingered at about 60% went up to 100% after implementation of these guidelines in 1963 and has remained at that level since. Opinion of the value of the use of the Government Agencies (Army, Navy, Air Force, DCAS) is still divided. Centers using them heavily are in agreement that success depends on close contact and good communication from the beginning to the end of the project. One Center has a very well organized approach in this respect from which we will borrow features to develop our approach further. It was also interesting to note that the Centers where project people and reliability and quality assurance people are working close together during all phases of the project report more satisfactory progress than the other ones. Really refreshing was to see the support the procurement people in NASA Headquarters give to the quality and reliability assurance people. They rate the effects of teamwork between these two categories much higher than any incentive provisions in the contract.

NOTES 12/5/66 HAEUSSERMANN

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B 12/7

Negative Report.

NOTES 12/5/66 HEIMBURG

B 12/7

12 15 98

F-1

Test FW-056 was conducted for a mainstage duration of 40 seconds on the West Area F-1 Test Stand on December 2, 1966, with F-1 engine S/N F-5038. Primary test objectives were to establish a baseline for a thermal insulation test program and to evaluate modifications to the static firing instrumentation system.

LOX BARGE

MTF Lox Barge No. 5 has been completed with a functional test accomplished Friday, December 2, 1966. Unofficially, the Coast Guard has certified the barge. Presently, minor re-work, clean-up and lox unloading are being accomplished.

S-IVB

Stage 208 is presently scheduled for static firing on January 11, 1967. Stage 503 is scheduled for a re-start static firing on January 18, 1967.

B 12/7

NOTES 12-5-66 HOELZER

12-15-66

1. RELOCATION OF SECOND GENERATION SCIENTIFIC DIGITAL COMPUTERS:

As part of the overall Third Generation Computer Acquisition and Installation Plan, it is necessary for the Computation Laboratory to relocate its large-scale scientific digital computers and all auxiliary machines and services in the B-wing of Building 4663. To keep the disruption of service to a minimum, this move is scheduled for the weeks ending December 10, and December 17, 1966.

This relocation involves the following:

2 - IBM 7094 II Computer Systems with 30 tape drives,

6 - IBM 1401 Computer Systems with 15 tape drives,

13 - Electric Accounting machines,

Tape library of 6,000 tapes,

Scheduling, Production, and Card Punch Units,

32 - Card cabinets, desks, miscellaneous furniture for Operations Unit.

2. CONVERSION TO THIRD GENERATION COMPUTER EQUIPMENT:

In our Notes dated 10-24-66 (Copy attached), we reported serious problems in converting from the IBM AUTOCODER language to UNIVAC COBOL language in the business data processing area. We have now found additional funds to hire a number of CSC programming personnel for this one-time conversion, so that the situation should improve. A mechanical translation aid is also being explored which may further alleviate the problem. The chances of staying close to the original conversion schedule now appear to be much better than we originally estimated.

ATTACHMENT: Notes 10-24-66 Hoelzer (Copies to Dr. von Braun and Mr. Weidner only)

NOTES 12/5/66 JAMES B 12/7

FY 68 BUDGET: MSF Program Office advised us that the BOB markup showed a reduction of approximately $24 million (about 17%) in the Saturn IB FY 68 budget. Most of the reduction is in the prime stage contracts. We have furnished MSF Program Office justification for a rebuttal to BOB.

S-IB-8 ENGINE PROBLEMS: Mr. Heimburg's notes of 11/21/66 indicate that we did not have concurrence of all concerned in conducting the short duration static test of S-IB-8. We held a meeting on December 1 to review the entire story. Dr. Rees was present. We confirmed that the S-IB stage manager had approved the test after I.O., CCSD, Rocketdyne and our Test personnel had considered in detail the problems encountered. No one objected to conducting the test at this time. The engine lost 42 turbine blades (which were made of a wrong material) during the test. We did discover a bad procedure in that Chrysler has been obtaining test procedure waivers directly from Rocketdyne and have taken steps to insure that information of this type flows through the stage offices for approval.

TEFLON IN S-IB-7 ENGINE: We have established that the source of the teflon found in S-IB-7 H-1 engine is Solar, the subcontractor for the suction lines. The teflon is used in assembling the suction lines. Teflon from one suction line could enter only one engine so we will probably not have to open any other engines for inspection.

S-IVB-210 COMMON BULKHEAD: Ultrasonic and leak and dye checks have established that the S-IVB-210 common bulkhead now has sufficient moisture removed to be usable. Although final flight worthiness has not been officially granted by MSFC, the bulkhead has been re-allocated to S-IVB-211 to replace the one used on S-IVB-210.

SA-204 LAUNCH: Late word from KSC indicates that the spacecraft ECS unit was removed Friday night and shipped to the West Coast for repair of a leak in the water/glycol pump. This is expected to slip the launch date two to three weeks.

NOTES 12/5/66 JOHNSON

12/5/66

B 12/7

Project THERMO - Upon Dr. Werner's telephone request Messrs. Wood and Cody (R-P&VE) will make to the Mission Planning Task Force an informal presentation on Project THERMO on 12/5/66. Dr. Werner will try to present the Project in the next ECP (Experiment Coordination Panel) meeting with the possibility of presenting it to the MSFEB during the 3/67 meeting. ✓

Dr. Werner has also informed, that the OMSF Experiment Review Ad Hoc Group proposes to review Project THERMO at MSFC on 12/12/66. Purpose of the review will be to determine the readiness of the THERMO experiments for submission to the ECP on 12/13 or 12/20/66. ✓

B 12/7

NOTES 12-5-66 KUERS

12/5968

S-II Stage Task Force on Manufacturing Problems: The joint NAA/MSFC task force on manufacturing problems of the S-II Stage convened last Monday at Los Angeles under the chairmanship of Mr. Ralph Ruud of the NAA corporate office. The following eight (8) problem areas were identified for review and discussion: Assembly Welding; Elbow Assembly and Installation; Cryogenic Fasteners; Material Handling; Fabrication of LH_2 Panels; Dollar Weld- Lox Bulkhead; Surface Imperfections; and Insulation. Each subject was then discussed with respect to tooling and equipment improvements required, design considerations, quality assurance considerations, manufacturing processes and procedure improvements required with possible development of back-up processes, and repair techniques. In some areas we had quite detailed discussions and exchange of ideas and experience. Never before had we found such willingness to listen to our suggestions and to enter into an objective analysis of the manufacturing problems. From understanding the problems and shortcomings of techniques presently applied we proceeded then in establishing nine (9) different programs or action items which will be jointly followed up by the task force. I believe that a noteworthy improvement of cooperation not only between S&ID and MSFC but also among the different organizational segments of S&ID has been achieved.

NOTES 12-5-66 LUCAS

12159 B 12/7

1. INSTRUMENT UNIT QUALIFICATION STATUS: All I.U. ECS components are completely qualified, except two items - the gas bearing solenoid valve and the coolant pump. Mandatory qualification testing only has been completed on these two items.

2. S-IVB QUALIFICATION STATUS: The S-IVB Ad Hoc Propulsion Assessment Team reviewed and approved 17 propulsion components as having fulfilled the requirements of mandatory testing relative to the launch of S-IVB-204. There are now four of a total 34 mandatory test programs remaining for 204 launch milestone. These tests do not represent formal qualification.

3. ADVANCED CRYOGENIC ROCKET ENGINEERING PROJECT (AIR FORCE/NASA JOINT PROGRAM:) A Project Approval Document (PAD) and a preliminary Project Development Plan for the above project is being prepared for Dr. Seamans' review on Dec. 7, 1966. This PAD is to expand the scope of the current critical component investigation effort to include testing of full experimental engine systems. Approval of the PAD will allow proceeding with the plans which have been discussed with you.

4. S-IVB APS BLADDERS: Permeation of gas through the Teflon APS bladders has caused concern relative to the performance of the S-IVB engines. MSFC tests have demonstrated that there are no detrimental effects when "slugs" of gas are fed directly into the engines during operation. DAC and MSFC agree that operational procedures can be modified to "bleed off" the excess gas prior to launch; thus, the item is no longer of concern.

5. GROUND TEST MODULE: Results and recommendations of a P&VE study on the "O" NPSP NERVA Engine feed system concept were presented to SNPO-C and NERVA Engine Contractors on November 22, 1966, at Sacramento, California. SNPO indicated tentatively acceptance of the P&VE recommendations to select a 2-4 psi NPSP concept based upon existing state-of-art capability. The P&VE approach would be less expensive and require less development time.

6. NATURAL BUOYANCY TEST FACILITY (NBTF) REQUIREMENTS: The R-ME large neutral buoyancy test facility (NBTF) construction will not be available for at least 9-12 months and the existing R-ME NBTF will not accommodate the presently identified NBTF requirements for both the ATM and Orbital Workshop. There is a need for an additional interim facility. The use of the S-IC-C or S-IC-S is a possibility as an interim NBTF. Utilization of the General Electric Virgin Island NBTF is also being considered.

7. RACK/PM ACCESS REVIEW: The access review for the RACK/PM was held November 30 and December 1. A mockup of the S-IVB forward skirt area, IU, SLA, RACK, PM and docking collar was set up in building 4755. One set of IU area access platforms and handling equipment for servicing the IU, forward S-IVB, and lower LM were installed and their use demonstrated to personnel from the Air Force, MSC, Belcomm, -8 Contractor , Aerospace, KSC, and MSFC. The review started with a briefing on the status of the RACK as related to the PM. All of the equipment proved satisfactory to all known requirements. Only minor refinements to the equipment and platforms are needed.

8. TURBINE BLADE FAILURE OF S-IB-8 ENGINE: The cause of the turbine blade failure on engine S/N 4078 was due to improper blade material. The specified material is Haynes Stellite 21, whereas 42 of the blades from this turbine were manufactured from 316 stainless steel. X-rays of the turbine blade to hub weld joint are being inspected to determine if other wheels installed on [illegible] engines of S-IB-4 and subsequent contain blades of the 316 material. Five other turbines of H-1 engines have been identified as containing 316 material blades to date. Two of these engines are IB-7, two on IB-8 and one on IB-10. Further evaluation is continuing.

NOTES 12/5/66 MAUS

12/59B

B 12/7

FUNCTIONAL MANAGEMENT REVIEW - Mr. Rieke is conducting a study of NASA functional management. Three members of the study team visited MSFC on November 30 and December 1 to interview MSFC functional managers. Mr. Gorman held entrance and exit interviews. Study results and recommendations to improve NASA functional management will be presented to Mr. Webb in about three months.

CONGRESSIONAL VISIT - Representative Robert N. Giaimo (D-Conn.) and Representative George Shipley (D-Ill.), members of the House Appropriations Subcommittee on Independent Offices will visit the Michoud plant on December 8. They will be accompanied by Dick Callaghan and Mr. Homer Skarin of the Committee staff. The Congressmen will visit NAA at Downey on December 6, MSC on the morning of the 8th, Michoud on the afternoon of the 8th and KSC on December 9.

The tour is informational in nature; both Congressmen will have their wives with them.

BOB MARK FY-68 - Mr. Kretner from the Bureau of the Budget has submitted preliminary figures reducing Saturn I and V approximately $89 million below the stated requirements. MSF made a strong reclama to this proposal on Wednesday, November 30.

BOB REQUESTED NASA STUDY OF TITAN III/MOL HARDWARE FOR AAP - As you recall MSF had completed this study early in October and Dr. Seamans approved the study results for forwarding to BOB.

After receiving the study, BOB had several questions which were quickly answered by MSF. We understand that BOB accepted the study conclusions that the cost savings resulting from use of Titan III/MOL hardware were insignificant.

It is the feeling in MSF that this question is closed - at least for the time being.

B 12/7

NOTES 12/5/66 RICHARD

12/59

Saturn V Launch Sequence: On Saturn IB the system can be recycled to approximately X - 15 minutes if an interlock temporarily prevents ignition command (such as happened on AS-201). Any cutoff after ignition command means a scrub for that day.

The Saturn V design requires swing arm number 2 to be removed about six seconds prior to ignition command. Since the vehicle can remain in this condition for only ten minutes, the mission start point on Saturn V will be at the command to that arm and not at ignition. Any interruptions after that time will mean a scrub for that launch window. We are working with all concerned to make our interlocking, etc., consistent with this commitment point.

This is not necessarily a serious impact, and we can live with it; but it will require a little readjustment in our thinking from the Saturn IB operations.

B 12/7

NOTES 12/5/66 RUDOLPH

12/59(1)

1. S-II Stage Common Bulkhead Test Tank (CBTT) - failed during test on Thurs., 1 Dec 66 at approximately 38.4 PSIG measured at the Apex of the LH_2 forward bulkhead. The S-II-4 doubler was to have been qualified at 39.0 PSIG.

Failure appeared to have occurred near the LH_2 cylinder #1 to J-ring weld. The LH_2 forward bulkhead now appears to be resting on the common bulkhead. The LOX tank continued to hold pressure.

A board of investigation is being established. Program impact not yet determined.

2. S-II-1 Stage - first captive acceptance firing was accomplished at 12:25 am, Thurs., 1 Dec 66 at MTF, with a full duration firing of 384 seconds.

Several significant problems were encountered, e.g., damaged membrane seal, excessive decay rate in valve activating He bottles, PU adjustment, damaged LH_2 feed line purge, small H_2 leaks in boattail, etc.

The next firing is paced by the replacement time for the damaged membrane seal. We anticipate the firing to occur sometime between Weds., 21 Dec 66 and Sun., 1 Jan 67.

3. S-II-3 Stage Forward LH_2 Bulkhead - was damaged on Tues., 29 Nov 66, when a ten-foot section of an access ladder fell from a height of approximately 15 feet and impacted the inside of the LH_2 forward bulkhead.

In-Tank Systems Installations Operations had been completed (stage in horizontal position) and the personnel entrance ladder mechanism was being retracted from the LH_2 tank through the access port in the forward LH_2 bulkhead. During the access ladder removal operation, a weld in the retracting mechanism failed causing the ladder to fall.

Three cracks through one bulkhead gore were found, the longest of which is about 52 inches in length. Repair being investigated.

A Board of Investigation has been established. Program impact not yet determined.

4. S-II-4 and S-II-5 Stages - are undergoing major technical and schedule assessment due to the offset girth weld problem (cylinder #6 to forward LH_2 bulkhead). Meetings among MSFC, NAA and outside consultants were held on Friday, 2 Dec 66 and Saturday, 3 Dec 66, to determine course of action re this problem. A separate report on this item will be forwarded later this week.

NOTES 12/5/66 SPEER B 12/7

12/5 RD

1. AS-501 LAUNCH RULES: Initial MSFC launch rules inputs for AS-501 have been submitted to KSC. Based on a review held prior to their submission, we have a good basic package but a lot of work remains to firm up all rules and either validate or eliminate some launch constraints. Work is continuing.

2. MISSION OPERATIONS QUARTERLY REVIEW: The MSFC Quarterly Review of Mission Operations activities was held on November 29, 1966. The review addressed primarily the orbital operations phase of the lunar mission. Attendance of the review was very good and several actions in the area of orbital checkout were generated.

3. ATLANTIC VS. PACIFIC RECOVERY FOR SATURN V: In answer to a request from Gen. Phillips, MSC has evaluated the feasibility of using the Atlantic rather than the Pacific recovery for Saturn V/Apollo missions. R-AERO provided MSC with L/V flight mechanics data. The conclusions are: (1) AS-501 and 502 should remain as planned with a Pacific recovery; (2) AS-504 and all subsequent lunar missions should retain the Pacific recovery; (3) AS-503 and any other earth orbital missions can be planned for Atlantic recovery. The study was started with the hope that Atlantic recoveries would be less expensive as far as DOD reimbursement is concerned. This appears to be questionable.

4. ROLE OF HOSC IN RENDEZVOUS MISSIONS: Under a basic agreement reached some time ago by the Flight Mechanics Panel, the L/V guidance target vector for AS-208 will be updated during the terminal countdown based upon tracking of the orbiting 205 CSM. The update will be performed by a digital command transmitted from Houston Control Center by the Booster Systems Engineer. Verification that the updated target vector is compatible with the launch vehicle and its capabilities (Go-No Go) will be performed here in the HOSC.

5. NASA-DOD INTERFACE ON TRACKING AND DATA ACQUISITION: Dr. Seamans issued an important policy statement on 11/21 regulating the relationships within NASA and between NASA and DOD in the planning, establishment, and use of launch, launch support, tracking, data acquisition and processing, and communications facilities. This policy modifies the Webb-McNamara Agreement of January, 1963. The long standing controversy between KSC and GSFC on their respective responsibilities in these areas should be resolved by this policy. I recommend careful study of this document by all MSFC elements concerned (additional copies available on request).

Ship via ordered by phone 12/8/66.

Can I have a copy? B

NOTES 12-5-66 Stuhlinger

12/6 PB

B 12/7

1. ATM: Considerable effort was expended during past weeks by ATM Experiment Scientists and Experiment Engineers to establish requirements regarding pointing accuracies, roll coordinates, orbit-to-ground communications, and visible displays in the LM. It is expected that final agreements will be reached on these requirements during the Principal Investigator meeting at MSFC this week.

2. PRESENTATION TO STAC COMMITTEE: Dr. Charles Townes, Chairman of OMSF's STAC Committee, asked me to present the EMR proposal to the Committee at MSC on December 9. I met briefly with Dr. Townes last week and discussed details of the presentation.

3. AUTOMATIC STABILIZATION OF ATM: Gerhard Heller and Bill Snoddy of SSL visited the Mt. Wilson Solar Observatory last week and watched the adjustment of the automatic guidance system and the preparation of the instrument for an automatic run of the magnetograph. Guidance to an accuracy of 1 arc sec is achieved by a nulling technique of 2 sensors in each axis. An accuracy of 0.1 arc sec should be possible in space. It is obvious that the use of an astronaut for holding of the telescope for an extended time would not be reasonable. The automatic mode as presently planned for ATM by ASTR for a stability of ± 2.5" seems to be the only sensible method.

4. TRANSFER OF LUNAR DRILL TO TEST LAB: We held briefings with members of the Test Laboratory, Northrop, and Westinghouse regarding the current status of the lunar drill efforts. Each contractor discussed his specific concepts and the problems associated with them. We have agreed to provide support to Test Laboratory through our Brown Engineering Support Contractor for a limited period until Test Laboratory has become familiar with each piece of equipment. We feel that considerable scientific support will be needed by Test Laboratory during the test and evaluation phases.

5. AIAA MEETING IN BOSTON: Frank Williams, substituting for you on two panels, represented our Center very well. Main impressions gathered in the presentations and during in-between discussions, were the following: Spaceflight technology, including chemical propulsion, control, and guidance, is now on a high level of perfection; the Apollo Project has an excellent chance of succeeding on time; space science is moving quickly toward the foreground of space program activities; electric space power supplies in the multi-kw range are badly behind in development; both nuclear propulsion and electric propulsion are ready for mission planning. In view of this mostly favorable state of affairs, the panel on Space and Public Policy was expected to be of great interest. The fact that panelists hedged on all questions concerning "Space Program, quo vadis?" was a disappointment to the large audience.

NOTES 12/5/66 WILLIAMS

12/5 PD

B 12/7

1. Lunar Flying Vehicle (POGO): Final contract negotiations and award are being delayed somewhat due to a lack of complete pricing information from Bell Aerosystems. This is being resolved now; however, it will result in about a one-week slip in contract start. Some preliminary negotiations can be completed by this means. The contract is now expected to be forwarded to Bell for signature by next Friday, December 9, 1966. ✓

2. Ground Equipped Workshop: Bids from the six contractors have been evaluated and a selection made. Headquarters has been advised by teletype of this selection, and we have requested authority to negotiate with the chosen contractor. ✓

3. Vehicles Group - Recovery Studies: Contract has been negotiated with Boeing ($245K). We expect the contracting officer's signature shortly. The study is for an eight-month period and is to assess available and future test program alternatives that could provide technical data and initial feasibility demonstrations pertinent to large ballistic launch vehicle recovery programs, both liquids and solids, with emphasis on the S-IC booster. ✓

Dec. 12, 1966

OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	☐ ACTION	☐ INFORMATION
	Mr. Shepherd			

REMARKS

Dr. von Braun's visit to Quality Lab was rescheduled so many times that Mr. Grau decided he wanted to forget about it with Dr. von Braun and go ahead with just Mr. Weidner. Mr. Weidner is now scheduled to visit Friday, March 3 at 2:30 p.m. Do you want to go along?

Tentatively yes -

nancy
3-1-67

CODE	NAME	DATE

MSFC - Form 495 (Rev August 1963)

1. Navy ng 3. agenda ~~[illegible]~~
2. Engines ~~1/31/67~~ ~~2/2/67~~ ~~9-10~~ ~~2/8/67~~ ~~2/6/67~~ ~~3/3/67~~

Thurs?

NOTES 12-12-66 GRAU
12/12 9&8 B 12/18

Rescheduled on Weidner's Calendar for 2:30 Friday March 3.

1. H-1 ENGINE PROGRAM: The MSFC and Rocketdyne delegation which visited Haynes Stellite on December 3, 1966, concluded that the inprocess material controls and the final blade inspection were not adequate to prevent recurrence of 316 stainless steel inadvertently being substituted for Haynes Stellite in fabrication of turbine wheel blades. The mix in materials could have occurred in various ways, but probably occurred in the metal weighing area of the plant. Several methods of controls were proposed and met general acceptance for installation at Haynes Stellite and Rocketdyne. Also, Rocketdyne is preparing a revision to their receiving inspection and sampling plan, and to the inspection plan at Haynes Stellite, which will be approved by this Laboratory. Of interest is the fact that the Haynes Stellite Company had been surveyed on a yearly basis by Rocketdyne for compliance with NPC 200-3, and was scheduled for another survey in September of this year. The September survey was not performed due to a strike which was in progress. ✓

2. RCA-110A REWORK PROGRAM: Representatives from this Laboratory are on TDY to Van Nuys, California, examining the possibility of repairing scrapped PC boards using new rework techniques. Approximately half of the total number have been evaluated and the possible recovery rate is a disappointing 15 percent. ✓

3. BUILDING 4752: In that you have not yet had the opportunity to make the tour of building 4752 which you desired, the following brief description of our activities in that facility may be of interest. We use building 4752 as a central receiving facility for all incoming hardware provided by various vendors and contractors. Specialized precision analysis equipment includes X-ray, ultrasonic, eddy current and other nondestructive testing equipment; super-micrometers with accuracies approaching one-millionth of an inch; Radiflo (radioactive), Searchray X-ray, TACT (Transistor and Components Tester) and other automated test equipment for testing all semi-conductors to verify electrical parameters. Facilities for destructive examination exists in a metallographic laboratory which has an electron microscope among its equipment. The bay area serves a multiple purpose as a staging area for incoming and outgoing hardware, and for alignment of large structures utilizing a 34-foot diameter rotary table. Present planning includes the future use of the bay area for checkout of the Ground Nuclear Module and as a center receiving point for S/AAP experiments. You have a standing invitation to visit the facility at your convenience.

D.G. Let me make this visit in January. Please arrange time with Bonnie. B

Betty Miller called; set up for ~~1/31/67~~, 9-10. von Grau will meet Dr. von Braun at front door of Bldg. 4752 at 9 a.m.

X Rescheduled for Feb 2, 1967.

NOTES 12/12/66 BALCH

B 12/18

12/12 KS

S-II-1 Test Program - Preparation of the S-II-1 for the second static firing is continuing to meet a December 20th schedule. LH_2 feed duct purge channel and membrane seal repairs continue on schedule. It is NASA's and S&ID's concurrence that the first static firing met with the success criteria proposed by the Stage Office. Investigations are continuing against damage claims filed by residents as a result of the static firing.

S-II-A-1 Activation - Activation continues on schedule to support completion date of January 27, 1967. GSE is 95% complete. Pacing areas are Corps of Engineers, GE technical systems, and S&ID interfaces.

S-IC B-2 Activation - The B-2 test stand has been turned over from the Corps of Engineers and accepted with discrepant qualifications by NASA. The current firing schedule of January 27, 1967, is still firm. The S-IC-T is scheduled to be on stand 12/19/66.

Congressional Visitor - Senator John C. Stennis and members of his staff visited MTF on Tuesday, December 6, 1966. Briefing and a guided tour of MTF were conducted by Mr. Balch and key personnel. At the conclusion of Senator Stennis's visit, he complimented the MTF personnel as "Some of the best trained and most conscientious workers I have met at any installation."

"Station Break" Color Slides - MTF provided color slides to all local TV stations to be utilized as "institutional" advertising for MTF.

Incentive Awards Ceremony - An Incentive Awards Ceremony for NASA/MTF personnel is planned for December 14, 1966.

Labor Situation - No workers out due to labor situation.

NOTES 12/12/66 BELEW

12/12 KS

B 12/18

AAP MISSION FLIGHT NUMBER ONE: A meeting between the Manned Spacecraft Center (MSC) and Dr. Mueller has been scheduled for about the 19th to discuss the alternates for Apollo Applications Mission A Flight Number 1, (Lunar Mapping and Survey System). We are preparing information on cost, schedule, and payload influences involved with carrying the Rack, a radar altimeter; and stabilization and docking systems on this mission to support MSC.

APPLICATIONS A AND B: MSC has established a working group of 30 - 50 people at the Ellington Air Base to perform a phase B study of the EO-2 and EO-6 group of experiments. Among the carriers being considered for these experiments are the airlock module and the MSFC Rack.

MISSION PLANNING TASK FORCE: SAAP Mission Planning Task Force Meeting was held at Washington on 12/5 - 12/6. The subject of this meeting was the 1969 flights (AAP 5/6/7/8) and their potential payload packages (ATM, Thermo, EMR and Applications "A").

REFURBISHED COMMAND MODULE (RCM): The following are excerpts from the MSC/NAA Refurbished Command Module briefing at Headquarters on 12/8/66: (1) What is the Centers' (MSC's and MSFC's) reaction to utilization of the RCM as a resupply carrier for the 28-day mission and to using the fully RCM as a back-up return vehicle for the 56-day mission. It appears that we must requalify the CSM for the 56-day mission. (2) Question from Mueller's office: Can the RCM be made available for Mission 212? (3) Is it possible to launch the RCM with the LM/ATM or with the CSM?

LM/ATM MISSION AD HOC TASK TEAM: MSC has named Mr. Jim Chamberlain to head the MSC's LM/ATM Mission Ad Hoc Task Team effort. In view of the urgency for working the LM/ATM interfaces, Mr. George Hardy visited MSC this week (12/9/66) to talk with Jim Chamberlain and Bob Thompson about an immediate kick-off meeting of the Team.

MULTIPLE DOCKING ADAPTER (MDA): MSC personnel will be here on 12/14/66, to discuss the MDA design.

THIRD ATM PRINCIPAL INVESTIGATORS MEETING: Third periodic meeting between ATM Principal Investigators (P.I.'s), astronautics, and MSFC representatives was held on 12/6. Primary areas of concern were: (a) Experiment film carry-back volume and weight, (b) Procurement and performance of bi-refringent H-Alpha filters (2 - 2 1/2-year lead time), (c) Schedule slippages against requirements.

ATM PROJECT BRIEFING TO THE SOLAR PHYSICS SUBCOMMITTEE: A briefing on the ATM Project was given to the Solar Physics Subcommittee (of the OSSA Space Sciences Steering Committee). Their principal comments were related to: (a) Availability of acceptable bi-refringent H-Alpha filters, (b) The optimism with which we are pursuing the 1968 launch. They requested that as soon as possible a complete assessment be made of the potential slips and a recommendation be made on a more "realistic" schedule so that OSSA management can be briefed and relationships to other programs assessed.

ORBITAL WORKSHOP: Action items on Douglas Aircraft meetings last week at MSFC concern meteoroid bumper, passivation, floor, crew quarters and thermal curtain, installation, quick release hatch, fire retardant, and minor mods on sealing tank outlets. Several DAC engineers visited McDonnell on 12/8, to discuss the S-IVB/Airlock interfaces.

NOTES 12-12-66 BROWN

12/12 9FS

B 12/18

H-1 ENGINE As previously reported, the 42 turbine blades that failed in engine H-4078 (S-IB-208) were made from 316 stainless steel rather than Haynes Stellite 21. The validity of examining existing X-rays to determine which engines may have blades of the wrong material has been established. Engines in H-1, Atlas, and Thor are involved. A total of 816 wheel X-rays have been examined, and 28 of these have mixed blades. Ten of the 28 wheels are in H-1 engines; ten are in Thor and Atlas sustainer engines; six are in R&D engines; and two were scrapped in production.

The H-1 engines with discrepant blades are as follows:

Vehicle	Engine	Nr. Discrepant Blades
S-IB-207	H-4073	5
	H-4078	3
S-IB-208	H-4077	33
	H-4078(failed & replaced)	42
	H-7081	6
	H-7083	11
	H-7085	1
S-IB-209	H-4081	6
	H-7086	5
S-IB-210	H-7092	2

A decision has been made to remove the engines with discrepant blades in S-IB-207 and S-IB-208 at Michoud, and return them to Neosho for repair and static test. They will then be reinstalled in their original positions in the stages at Michoud. The engines from S-IB-209 and S-IB-210 will be replaced with spare engines prior to stage static test at MSFC. ✓

J-2 ENGINE The J-2 engine in S-IVB 501 at KSC was partially wetted with hydraulic fluid during a stage hydraulic system flush and bleed operation on 12-5-66. The thrust chamber and main fuel valve insulation and some electrical connectors were partially saturated. Rocketdyne is evaluating the extent of damage to the engine insulation and components. A recommendation on cleaning or replacement is expected next week. ✓

F-1 ENGINE The formal QUAL II F-1 engine teardown inspection review was held at Canoga Park, California, on 11-29-66, and the discrepancies found were about as anticipated, with none considered sufficiently serious to require corrective action of a retrofit nature. A final report, giving results of the QUAL II engine testing and teardown inspection, should be submitted by the Contractor within 60 days. ✓

NOTES 12/12/66 CONSTAN B 12/8

12/12/65

U. S. Army Missile Command and MSFC officials visited Michoud Dec. 7 for briefings, luncheon and tour. Representing the Missile Command were Col. William F. Kaiser, Chief of Staff; Col. J. N. Jean, Director, Support Operations Directorate; Lt. Col. Samuel E. Tillery, Chief, Air Transport Branch; Mr. William Henry, Post Engineer, and Mr. Stanley Wilkins, Chief, Transportation Division. MSFC personnel included Mr. Chauncey Huth, Mr. Gordon Dykes, Mr. Davis Foxworthy, Mr. Art Daley and Mr. Harold Katz.

On December 8, Rep. George Shipley (D-Ill.) and Rep. Robert Giaimo (D-Conn.), members of the Appropriations Committee, U. S. House of Representatives, and staff committee member Mr. Homer Skarin visited Michoud for a general tour and briefing. They were accompanied by Mr. Dick Callahan, NASA Headquarters Legislative Affairs Office. The group visited Michoud following visits to Boeing, Lockheed and North American installations on the West Coast and the Manned Spacecraft Center. They flew the following day to the Kennedy Space Center. ✓

NOTES 12/12/66 FELLOWS

12/12 9AS

B 12/18

1. Status of Saturn IB and Saturn V Initiations: For the first time, both Saturn IB and Saturn V actual initiations by R&DO laboratories and offices have exceeded planned initiations. As of November 30, dollar initiations for Saturn IB were $9.2 M, against a planned initiation of $8.6 M. The Saturn IB annual plan is $13.6 M. In the Saturn V Program, $53.0 M was initiated through November 30, against a planned initiation of $52.2 M. The Saturn V annual plan is $85.1 M. Elements of R&DO will continue to emphasize initiation of our funding allocations so we can realize the fine initiation rate experienced so far this fiscal year.

2. Transfer of Laboratory Responsibility for the Lunar Drill: Research Projects Laboratory has managed the advanced design of the Lunar Drill from early studies through the recent receipt of an engineering model of the Drill. In view of the requirement for substantial engineering manpower and shop and testing facilities, responsibility for the Lunar Drill task has been transferred to the Test Laboratory. Test will be responsible for the testing and development and, subsequently, the selection of a single concept for the Lunar Drill. Research Projects Laboratory will provide a principal scientific adviser to assure that the design and development effort is consistent with the requirements of the scientific objectives. An overall Lunar Drill accomplishment plan will be prepared by Test Laboratory to include major activities to be undertaken in the accomplishment of the Lunar Drill assignment.

NOTES 12/12/66 GEISSLER B 12/18

12/12 RTS

1. Aero-Astrodynamics Representative in Technical Systems Office: The Technical Systems Office (TSO) needs a man experienced in the disciplines of Aero-Astrodynamics Laboratory. This employee would represent our laboratory's disciplines in the Systems Engineering activities of TSO; he would in no way replace the working arrangements between TSO and our Projects Office, but would strengthen these arrangements. I have agreed with Mr. Ludie Richard to furnish this man on a rotational basis. Mr. Ellery May, of my Technical and Scientific Staff, will join Technical Systems Office on a detail not to exceed one year. At the end of his assignment, another Aero-Astrodynamics employee will be selected to replace him.

2. Recent Contributions in Dynamical and Statistical Meteorology to Aerospace Vehicle Problems: Our Aerospace Environment Division has arranged a meeting on this subject for Thursday December 15, in the 10th floor conference room of building 4200 (7:45 - 4:30). The central theme of the meeting is reflected in the above title. In describing the "recent contributions," the speakers will discuss topics such as: "Atmospheric Variability," "Effects of Atmospheric Waves on Wind and Temperature Profiles," "Effects of Atmospheric Variability on Sound Propagation," and "Decision Theory for Aerospace Operations." The technical presentations are mainly outgrowths of research tasks sponsored by this laboratory. The eight speakers are: Prof. La Suer, Florida State University; Prof. Danielsen, Penn State University; Dr. Kreitzberg, Air Force Cambridge Laboratories; Dr. Barger, Laboratory for Environmental Data; Dr. Crutcher, National Weather Records Center; Dr. Buell, Kaman Nuclear; Prof. Cohen, University of Georgia; and Prof. Gleeson, Florida State University. Based on invitation responses, we expect about 40 attendees from outside MSFC. They will include an excellent cross-section of the scientific and technical community, and we are most pleased at the interest shown.

3. Nike-Tomahawk Thermosphere Display: The full scale unit of this system, on display in the lobby of Building 4200, is what we shall employ at the Cape in a day-night measurement program to study the diurnal variation of density, pressure, etc. in the 120 to 330 km altitude region. It will also be used to flight test the orbital densitometer prior to its use in an Apollo flight program.

NOTES 12-12-66 GRAU

12/12 9:45 B 12/12

1. H-1 ENGINE PROGRAM: The MSFC and Rocketdyne delegation which visited Haynes Stellite on December 3, 1966, concluded that the inprocess material controls and the final blade inspection were not adequate to prevent recurrence of 316 stainless steel inadvertently being substituted for Haynes Stellite in fabrication of turbine wheel blades. The mix in materials could have occurred in various ways, but probably occurred in the metal weighing area of the plant. Several methods of controls were proposed and met general acceptance for installation at Haynes Stellite and Rocketdyne. Also, Rocketdyne is preparing a revision to their receiving inspection and sampling plan, and to the inspection plan at Haynes Stellite, which will be approved by this Laboratory. Of interest is the fact that the Haynes Stellite Company had been surveyed on a yearly basis by Rocketdyne for compliance with NPC 200-3, and was scheduled for another survey in September of this year. The September survey was not performed due to a strike which was in progress.

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D.F.
Let me make this visit in January, Please arrange time with Bonne,
B

NOTES 12/12/66 HAEUSSERMANN

12/12 9:50 B 12/18

ATM

A status presentation was given by the Astrionics Laboratory and I. O. to the Solar Physics Subcommittee.

Specific areas of discussion were:

1. The ability to meet the Dec. 68 launch with all experiments being ready by that time.

2. The absolute necessity of launching at that time.

3. The availability of hydrogen-alpha filters.

4. The desirability of launching the CSM and the LM/ATM on one vehicle.

W.H. That's dead. Isn't it? B

The concern about the H alpha filters is shared by us and a subsequent note will appraise you more fully of the situation. → 1 is in Houston! B

Test Facilities

The super linear accelerator (Sulinac), applying a pneumatic mechanism for cyclic operation, is working up to the maximum drop height of 80 ft. Demonstration can be given.

NOTES 12/12/66 HEIMBURG

B 12/18

12/12 9<S

F-1

The cracked tubes in thrust chamber on F-1 Engine S/N 5038 were repaired in preparation for the next test. Testing will resume as soon as the Parker S-IC Lox vent valve is installed and checked out (December 15 or 16, 1966).

LOX BARGE

The MTF Lox Barge No. 5 modification and checkout was completed on schedule and the barge departed on December 8, 1966, for MTF.

S-IB

Stage S-IB-8 was removed from the Static Test Tower East on December 9,1966, loaded on the Barge Poseidon, and shipped to the Michoud Assembly Facility. The turbine blade material investigation found that the turbines of engines in positions No. 2, 3, 4 and 5 all have some blades cast out of 316 stainless steel alloy. These engines will be removed at Michoud, sent to Neosho for turbine wheel replacement and engine firing and then will be returned for re-installation in the S-IB-8 stage.

GROUND SUPPORT EQUIPMENT

The 502 Arms (4, 5, 6, 7) will not be shipped to KSC as mutually scheduled last September due to problems encountered during testing which required additional test time to solve (i.e. - Failure of lox coupling withdrawal cable - Arm 4; Failure of harpoon seals - Arms 4,5,6; Additional testing required for the third locking device of umbilical - Arm 6; etc.). In addition, many hardware modifications involving vehicle servicing hardware have recently been submitted that impact the schedule. We are working with KSC on establishing a new delivery schedule. No program impact is foreseen (due to S-II Stage slippages)

B 4/18

NOTES 12-12-66 HOELZER

12/12 9 GS

Negative Report

NOTES 12/12/66 JAMES B 12/18

12/12 JS

70" LOX TANK QUALIFICATION TEST: Tests were conducted on the 70" LOX tank on December 8 and 9, and in the test with maximum fin load and maximum pressure went to 140%. In a subsequent test with maximum fin load and minimum ullage, the tank failed at 139%. Chrysler is requesting a waiver to the CEI Specification for this condition from 140% to 139%. Discussions with R&D personnel and the fact the -18 loads are sufficient (these tests were to 212 loads) indicate we can accept waiver. ✓

H-1 ENGINE TURBINE PROBLEM: As a result of the investigation of the turbine failure on S-IB-8, we will return all engines with 316 stainless steel turbine blades to Rocketdyne for replacement and hot firing. We also discovered that S-IB-4 has blades from an unacceptable vendor. A tabulation of stages affected follows:

S-IB-4 - one engine to be removed, repaired, refired and reinstalled.
S-IB-7 - two engines to be removed, repaired, refired and reinstalled.
S-IB-8 - four engines to be removed, repaired, refired and reinstalled.
S-IB-9 - two engines to be replaced with spares.
S-IB-10 - one engine to be replaced with spare. ✓

EXPEDITED COORDINATION OF CONTRACTOR FURNISHED DOCUMENTS: We have not been achieving timely delivery of MSFC approved documentation (such as test specifications and criteria) to KSC. The formal, sequential flow from contractor to I. O. to R&DO to I. O. to KSC just takes too long to maintain up-to-date documents at KSC. Because of this we have decided to permit contractors to distribute documents direct to KSC specifying an effectivity date which allows for a brief MSFC review. R&DO has agreed with this approach and we and R&DO plan to coordinate it with KSC this week. ✓

SA-204 PREFLIGHT REVIEW/FLIGHT READINESS REVIEW: The Preflight Review is now scheduled for January 31 and February 1; the Flight Readiness Review is tentatively scheduled for February 10. ✓

IU COMMONALITY IB AND V: In an effort to reduce changes the IU stage is no longer making non-mandatory changes purely for the sake of maintaining commonality with the Saturn V IU. We will make changes internal to black-boxes to simplify the spares problem, but we do not plan to make external changes necessary for Saturn V only. A recent change to Saturn V's IU umbilical plate necessitated by the wide swing of the larger missile is an example. This was not approved for Saturn IB IU. ✓

NOTES 12-12-66 JOHNSON

B 12/18

12/12 9:15

Pegasus III Coupon Measurement & Retrieval - The Engineering Development Plan (EDP) for subject experiment has been sent to HQ's for review. ✓

HQ's has requested Bellcomm to prepare a draft Experiment Implementation Plan. ✓

Project THERMO - Review by the MSF Experiment Review Ad Hoc Group, originally proposed for 12-12-66, will be held at MSFC on 1-5-67. This review is to determine the readiness of the experiments for initiation of the series of events leading to flight approval by the MSFEB. ✓

Crossed-Beam Correlation - Efforts are in progress to extend the crossed-beam technique to micrometeorological studies of mean winds and turbulence near the earth's surface. ESSA/ITSA (Environmental Science Services Administration/Institute for Telecommunication Sciences and Aeronomy) is cooperating in the effort and is offering both technical support and "cost sharing." We will inform you as to the exact arrangements planned with ESSA when they are more firm. ✓

NOTES 12-12-66 KUERS

12/12 KS

B 12/18

1. Damper Arms: The first damper arm and the associated console will be ready for display to Dr. Mueller on Monday, December 12. We intend to ship the arm structure and its control console to R-TEST on December 15. The winch and its control console are to be shipped on December 20; both items are on schedule. Preliminary tests indicate a redesign with a consequent necessity for rework will be necessary on the mechanism which grips the base of the LES. In the event this necessity arises, only the relevant parts will be retained at R-ME thus enabling R-TEST to begin their test program.

2. Welding Improvements on Saturn V S-II Stage: Techniques developed by Marshall's Manufacturing Engineering Laboratory for the Saturn V S-IC stage on weld joint preparatory cleaning and alignment are being successfully incorporated at NAA/S&ID on the S-II vehicle. Rejection of the S-II-4 cylindrical LOX girth weld (.500" thick) caused by excessive offset (up to .080") initiated a retrial of R-ME recommendations to control the mismatch by using the MSFC developed strap-clamp. The seam was rewelded last week with an .015" average offset; at no place did the offset exceed the permissible limit of .040". NAA has now fully accepted the strap-clamp alignment method for maximum future use. Additional improvements in S-II weld quality are anticipated soon, as a result of a training program now underway to develop the techniques of weld joint preparation by the MSFC recommended scraping techniques versus the filing method now used by S&ID. R-ME personnel are offering on-site instructions.

NOTES 12-12-66 LUCAS

12/12 9AS

B 12/18

1. ORGANIC SEMICONDUCTION PHENOMENA: The work of Dr. S. C. Mathur, NASA - National Academy of Science Post-Doctoral Fellow assigned to our Materials Division, has been successful and widely published. Dr. Mathur has developed band theory computational methods with which pertinent properties of organic semiconductors can be determined on the basis of chemical structure. This development eliminates the necessity for the difficult synthesis of a variety of molecular crystals for empirical determination of pertinent properties. Unfortunately, Dr. Mathur's tenure with us is nearly complete, and he will be returning to India shortly. During his residency, he has published six papers in the recognized literature covering his work and has authored or co-authored with Materials Division personnel an additional six papers, most of which have already been accepted for publication. His study work has provided a technical stimulus to our people and has opened several new avenues of development in the Organic Semiconduction Phenomena. If you could spare 10 - 15 minutes to see him, it would be an important gesture of recognition for his contribution and would have a favorable effect upon our Post-Doctoral Fellowship Program. He has already been instrumental in our getting two or three other Fellows from India.

B.L. Please arrange B

2. INTERNATIONAL INSTITUTE OF REFRIGERATION: Hans Paul has just received official notification of his appointment as a commission member of the International Institute of Refrigeration. Specifically, he is a member of Commission No. 1, which is concerned with "scientific problems of low temperature physics and thermodynamics, cryogenic engineering".

3. PERSONNEL: Mr. Robert O. McBrayer, formerly with the Crew Systems Division, MSC, joined our Human Factors Engineering Section on December 7.

4. LUNAR BACKPACK JUMPER AUGMENTOR: The Lunar Backpack Jumper Augmentor project, initiated in March 1966 by our Advanced Studies Office, will be completed on January 11, 1967. This effort consisted of the conceptual design of a light-weight (17 pounds) propulsion system primarily to augment the astronaut's lunar survey capability. It may also be effectively used as a portable "Lunar Crane" to assist in moving bulky objects. The unit can be worn at all times on the lunar surface and will not interfere with any normal bodily movements. The results of this study will be presented around January 25, 1967. A full-scale, inexpensive mock-up is being built to demonstrate the versatility of this unit. This will terminate our activity on the Lunar Backpack Jumper Augmentor.

Would like to see it B

5. F-1 ENGINE ELECTRICAL HARNESSES: Damaged electrical harnesses had been found on 501 engines at KSC. Similar damage was found on the 502 harnesses. Surface cracks on the molding and broken braidings were found, probably due to abusive handling. Propulsion, electrical and engine system personnel will be part of a Quality and P&VE Laboratory team to inspect and disposition harnesses.

MAUS 12/12/66

12/12/68

BOB MARK FY-68 - A reclama by MSF of BOB's preliminary mark, cutting Apollo $217 million in FY-68, was partially successful. The new mark will still be below the Apollo requirement forwarded by NASA but the cut will be less than the preliminary mark. The exact figure is not yet known. ✓

ADMINISTRATIVE OPERATIONS FY-68 CONGRESSIONAL BUDGET - The FY-68 AO Budget was completed and forwarded to MSF during the week. The Center was directed by MSF to submit this budget within dollar guidelines of $127.753 million and $126.289 million for FY-67 and FY-68. These guidelines are short of Center requirements by some $2.2 million in FY-67 and $3.6 million in FY-68. A statement identifying the deficit areas and impacts on the program was included in the preface of the Budget. ✓

DECEMBER PROGRAM REVIEW - We have received word that the format for the December Program Review will be modified. One and one-half hours will be allocated to Marshall to cover several specific items and any problems in addition which Marshall desires to present. Marshall is specifically requested to cover the following items:

S-II Technical Problems and Outlook
S-II Financial Status and Outlook
H-1 Turbine-blade Problem
Sustaining Engineering
Stress Corrosion - Material Compatibility

The routine items (change order status, manpower, etc.) are waived. In addition, a one and one-half hour special topic on software status will be included. ✓

CONGRESSIONAL VISIT TO MICHOUD - Congressmen Giaimo (D-Conn.) and Shipley (D-Ill.) of the House Independent Offices Appropriations Subcommittee visited Michoud on the afternoon of December 8, 1966, accompanied by Dick Callaghan and Committee Staff member Homer Skarin. The Congressmen were there to view activities rather than examine into the program. The Congressmen were impressed at seeing the eleventh of the twelve approved IB boosters in an advanced stage of assembly. Giaimo posed the only question of substance when he asked what was done in Michoud that could not be done at Huntsville. Dr. Constan explained why there was no redundancy. ✓

MANAGEMENT RESEARCH PRESENTATION - In view of Mr. Webb's continuing interest, we have prepared a presentation on management research which describes the kinds of activities being performed in this field by universities, private industry and selected government agencies, as well as recent activities under way in NASA Headquarters. We presented this material to Mr. Gorman on December 6, and he suggested we show it to you. ✓ If you agree, we shall put it on your calendar. ✓

→ Please do B

B 12/23

NOTES 12/12/66 RICHARD

12/12 9PB

No submission this week.

NOTES 12/12/66 RUDOLPH

12/12 '66

B 12/23

No report this week.

NOTES 12/12/66 SPEER

12/12/66 B 12/21

1. NETWORK SUPPORT FOR APOLLO MISSIONS: We have recently identified a number of problems relative to network support planning for Apollo and SAA missions: (1) the Apollo aircraft capabilities as contrasted with our needs; (2) identification and justification of network augmentations; (3) onboard system/ground interface constraints and limitations; (4) impact of station capabilities on range safety constraints; (5) utilization and sharing arrangements for ground support of the L/V and S/C. We are working these and other areas with the other responsible agencies through our Operations Support Requirements Sub-Panel. Through this media we have established an essential interface in this area with MSC, GSFC, KSC, and Headquarters.

2. AZUSA TRACKING: In answer to Dr. Mueller's request, MSFC has concurred in the decision not to implement the S-Band high precision tracking system and to drop the MSFC requirement for Azusa tracking after the launch of AS-503. KSC's new requirement for ODOP on operational flights is being reviewed by OMSF.

3. OPERATIONS COST EFFECTIVENESS: OMSF Mission Operations is taking new steps to review with the Deputy Center Directors the cost effectiveness of Apollo Operations Support. This effort had been initiated several months ago but it never materialized. The new impetus stems from McNamara's decision to charge NASA for every bit of service we receive from DOD. I plan to attend a premeeting in D. C. on 12/19.

4. HOSC ADDITION: Steel construction is almost complete. We need two and one-half weeks of good weather to finish concrete work and close in the work area. This is a critical step in maintaining the schedule.

5. TV TRANSMISSION OF MTF STATIC TESTS: Upon request by Gen. O'Connor we have initiated a study of technical problems, lead times, and cost on all elements of a video link from MTF to MSFC for transmission of static test coverage. Quick look analysis indicates a lead time of at least 2 months for a temporary solution and cost of $1,050 for each one-hour service. The study is not yet complete.

NOTES 12-12-66 Stuhlinger

12/n 9(2)

B 12/23

1. ATM: During the PI meeting last week, it was recognized and agreed that the pointing system of ATM must include a reference that permits absolute roll orientation on the solar disc with an accuracy of 10 arc min. This reference will be obtained from a star sensor fixed to Canopus (visual magnitude -0.9) near the ecliptic South Pole. The sensor will probably be rack-mounted.

2. EMR: RPL's presentation of the EMR project to the joint meeting of the Science and Technology Advisory Committee and Physics Advisory Committee at MSC last week was favorably received by the Committee members. Continuation of the effort was strongly recommended. We expect to formally submit the proposal to the Astronomy Subcommittee in February, 1967, and subsequently to the SSSC and the MSFEB.

3. DESIGN CRITERIA FOR NUCLEAR ENGINE TEST STAND: Mr. Stern and Mr. Byrd of RPL have reviewed the nuclear design criteria of Engine/System Test Stand-2, -3 as promulgated by Space Nuclear Propulsion Office. Based upon assumptions now known, they consider the criteria satisfactory at the present time. However, it is felt that the access times, etc. should be made tentative and preliminary until more study effort has gone into the evaluation of reactor radiation with its attendant activation of the test stand. ETS-1 test data, when available, may have a marked effect on these criteria as presently conceived.

4. DEVELOPMENT OF THERMIONIC POWER SUPPLIES: Mr. Dailey of RPL discussed the AEC situation on thermionic converter development with SNPO, after our discussions on this subject with members of Los Alamos Scientific Lab and General Dynamics/General Atomics. The Joint Committee on Atomic Energy (JCAE) requested AEC to earmark one million dollars additional funding for thermionics. This funding was to come out of other areas in the Reactor Div. and would go to the thermionic program elements which have not yet been transferred to Harry Finger.

It is not likely that anything will come of this for two reasons. First, the Commission does not want the JCAE to run the AEC, and would prefer not to set a precedent of giving in on this occasion. Secondly, whatever is started this year in Reactor Development will continue under Finger next year. He will have to find several million dollars more to fund such work properly, and he is convinced that the Viet Nam war will prevent such an expansion in his overall budget. So rather than encourage thermionics funding now, with a possible retrenchment following, Finger is sticking to the "component technology improvement" route for several more years. LASL, GD/GA, and others are convinced that component technology improvement has proceeded far enough (several thousand hours successful in-pile testing of converter units!) to warrant a feasibility demonstration phase of the in-pile thermionics converter system. A meeting will be held at AEC Headquarters between GE, GA, JPL, University of Arizona, Westinghouse, and MIT next week, with the purpose of defining a "critical experiment" that would bring about some progress in the development of thermionics-reactor systems in spite of the funding limitations.

NOTES 12/12/66 WILLIAMS

12/12 PKS

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1. Study Activities: A meeting was held in Washington, D. C., on December 6, to review the status of the various study activities (contracted studies, inhouse studies, JAG's, and committee efforts). Those present were:

Ed Gray and his senior people
Mr. Weidner, Mr. Williams, Mr. Becker - MSFC
Mr. Faget, Mr. West, Mr. Stony - MSC
Mr. Hock, Mr. Clayborn - KSC.

Although progress was made in defining what should be studied and worked on during the next 6 to 12 months, there are still some open items remaining, such as, center roles and missions and the degree of optimism to be used as study groundrules. I plan to bring these out in the FPPB meeting. ✓

2. Lunar Flying Vehicle (POGO): Contract negotiations have been completed (by phone) and preparation of the contract is now underway. It should be forwarded to Bell Aerosystems for signature by next Wednesday. Allowing one week for signature, work should begin about December 21, 1966. ✓

3. Lunar Surface Survey Module (LSSM): The LSSM Procurement Plan has been revised to reflect the up-to-date schedule and the delays since its initiation on September 2. ✓

Dec. 19, 1966

B 12/23

NOTES 12/19/66 BALCH

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S-II-1 Test Program - Leaks in the auxiliary system ignition requiring the replacement or modification of these lines on all five engines have caused the schedule of the second static firing to slip from 12/20/66 to 12/22/66. LH_2 tank entry is complete and minor discrepancies are being cleaned up. No major cracks found. All other repairs continue on schedule.

S-II A-1 Activation - BOD of the test stand, less high pressure gas and propellant systems, is expected the second week in January. Technical Systems are approximately 85% complete. Delays are being encountered by lack of Corps of Engineers' interfaces with Tech Systems.

S-IC/B-2 Activation - The S-IC-T vehicle was transported to the B-2 position and erected on the stand on December 17, 1966. Proof loading of the main derrick was completed on December 16, 1966. The LOX system was cold-shocked on December 11, 1966.

Data Handling System - The Data Handling System was officially turned over to NASA on December 13, 1966.

LOX Barge No. 5 - The LOX barge arrived from Huntsville on December 14, 1966.

Congressional Inquiry - In response to an MSFC request on 12/8/66 for MTF to furnish input for reply to the inquiry of Senators Murphy and Russell (Ref: AETRON Contract No. AE-013388, No-Bond Requirement), a complete explanation was furnished to MSFC on 12/14/66.

Hancock County Airport - Funds for the Hancock County Airport have been made available.

NOTES 12/19/66 BELEW

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MISSION PLANNING FOR 1969: A mission planning working session was held by personnel from NASA Headquarters, MSC and MSFC on December 15. Guidelines for the 1969 flights and action items for the next Mission Planning Task Force (MPTF) meeting were discussed. The next MPTF meeting will be held at KSC on January 11 and 12. ✓

INTEGRATED REVIEW OF THE ORBITAL WORKSHOP STATUS: An integrated review of the Orbital Workshop status was conducted on December 13. Headquarters, MSFC, MSC and KSC personnel attended. The MSFC general program status was presented along with preliminary habitability and crew quarters accommodation for the workshop, preliminary mission analysis, payload capabilities, and launch facilities schedule requirements. ✓

BENDIX CONTROL MOMENT GYRO (CMG) LONG LEAD ITEMS: Headquarters has authorized pre-contract expenditure of $500K for Bendix procurement of CMG early lead time items. The Bendix proposal for CMG's was received December 12 and is currently being evaluated. Negotiations are scheduled for January 4, 1967. ✓

AAP MISSION FLIGHT OPERATIONS: Integration contractor is analyzing orbital operations versus MSF network ground station capabilities, at this time from the limited information available it appears that: (1) the MSF network equipment can meet requirements for AAP 1 & 2; (2) a problem may exist in shadowing of the antennas by the cluster, (This problem is being looked at in keeping with projected experiment time-lines to see if it can be worked around.); (3) an operational evaluation of experiments to be conducted for flights AAP 1 & 2 regarding real time data requirements, delayed transmission and the conduct of alternate experiments is being made; (4) a list of crew operations ground rules have been compiled and are being coordinated with MSC. ✓

MULTIPLE DOCKING ADAPTER: MSFC and MSC personnel were at the NASA Headquarters on December 15 to present both Centers' design for the Multiple Docking Adapter (MDA) to Charles Mathews and John Disher. MSC's approach was developed by McDonnell Aircraft Corporation and was very similar to our design except that: (a) the Gemini radiator has been enlarged and forms the base of the MDA, (b) the docking ports are forward, and (c) both launch and docking loads are transferred to the Airlock and onto the SLA through the trusses. MSC also presented the Airlock modifications resulting from the cluster mission concept which generally crossed all subsystems. The trusses were modified, a two degree of freedom solar array was included, the radiator was enlarged, and a vertical hold stabilization system was incorporated as a back-up to the PGNS and to facilitate solar array orientation. MSC quoted a total cost and schedule impact of $21.8M and six months for the first AAP mission. We were not convinced that all the mods proposed were absolutely necessary and further we feel that the structural mods can be reduced, and some cost reduction can be effected if MSFC designs and builds the MDA. Further discussions are continuing today in Headquarters to arrive at the best method for MDA design and fabrication. ✓

NOTES 12-19-66 BROWN

F-1 ENGINE F-1 engine F-6049, flight spare for S-IC-6, was delivered to MSFC on 12-14-66, by low-bed truck. Engine F-6049 was fully instrumented to further evaluate the possibilities of routine truck shipment of F-1 engines. After receiving inspection at R-QUAL Lab, the engine will go to the TEST Lab for a 40-second firing and will be stored as a flight spare for Vehicle S-IC-6.

The 4-way hydraulic control valve has failed to operate during engine system checkout and required replacement on engines F-3013 (S-IC-1 at KSC), F-4025 (S-IC-3 at MSFC), and F-6050 (Rocketdyne acceptance test). Contamination has been found in all three valves and is considered to be the cause of failure. The 4-way valves on S-IC-1 and subsequent will be recycled and cleaned in accordance with revised cleaning specifications. The valves changeout will be accomplished in conjunction with installation of the redundant cutoff valves and the only impact to the program will be a slight increase in stage access time.

H-1 ENGINE The recent investigation of H-1 engine turbine blades disclosed that the first stage turbine blades of engine H-4059 in S-IB-204 were made from the proper material (Stellite 21) but were produced by a vendor, who is qualified for Air Force engines only. Failure history of these blades at the higher thrust level of the H-1 engine warranted replacement of the first stage turbine wheel. The engine was removed from the stage and returned to Neosho on 12-13-66. It will be reworked, static tested, and returned to KSC approximately 12-22-66. No launch impact on the vehicle is indicated.

J-2 ENGINE A start/restart test was conducted at AEDC on Tuesday, 12-13-66, for the purpose of conducting the restart under simulated worst conditions: cold thrust chamber and hot turbine exhaust crossover duct. It was first noted that the crossover duct would be warm for a restart after evaluating the orbital data from the SA-203 flight. The temperature of the crossover duct has a large influence on the relationship between the fuel pump speed buildup and the oxidizer pump speed buildup; and consequently, on the gas generator combustion temperature during the start transient. After a successful first burn test of 30 seconds duration and a simulated orbital hold the restart run was cutoff at 900 milliseconds by an overtemperature condition in the gas generator. This cutoff was expected due to the worst pre-start conditions. The test program at AEDC will be revised after an iteration with Rocketdyne this week. Impact on 501 will be assessed next week.

A cracked ASI LOX line was discovered during leak checks following the replacement of the main LOX valve on S-II-501 position No. 1 engine (2026). Rocketdyne took immediate action and redesigned the line last Thursday. The new design replaces the two piece line and manifold block with a one piece line and eliminates the butt weld joint that cracked on engine 2026. Two lines were vibrated on a shake table and a third one was run for 2260 seconds on an engine over the weekend. It has been determined that the new line is better than the old one; however, additional testing will be accomplished this week. Replacement of the lines on S-II-501 was initiated last night and should be completed by tonight.

NOTES - 12/6/66 - CONSTAN

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ASTRONAUTS VISIT MICHOUD

Astronauts William Anders, Frank Borman, Michael Collins, Charles Conrad and Clifton C. Williams visited the Michoud Assembly Facility Tuesday, December 13, for a briefing and tour. They were favorably impressed by the work here. They were accompanied by Howard P. Lloyd, James A. Wiley and Preston Farish of MSFC and John J. Van Rocket and Robert S. Sayers of MSC.

CONTRACT NAS8-5608, THE BOEING COMPANY

Supplemental Agreement MICH-310, for S-IC Stages 11 through 15 with a target cost of $112,000,000 and target fee of $8,137,500, was forwarded through MSFC Huntsville to NASA Headquarters during the week of December 12, 1966. Target date for approval is December 30, 1966.

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NOTES 12/~~16~~/66 FELLOWS

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1. Pre-launch Test and Checkout Specifications and Criteria: The technical review of the specifications and criteria documents and changes to the requirements has become a substantial R&DO workload and one which cannot always be completed before related changes are proposed by the prime contractors. Documents are prepared in such a manner that total review is necessary for each change, rather than being able to review just the changes themselves. The timing of completed reviews which overlap new changes has caused some deterioration of confidence between KSC and their prime contractor elements because known changes were submitted by the contractors in addition to the approved documents furnished to KSC by MSFC. To alleviate that problem, there was a joint R&DO/IO meeting on December 7 to review a proposed procedural change which would allow a change to be used by the contractor at KSC within a specified time after contractor release to MSFC, if they have heard nothing to the contrary within that period. R&DO would receive parallel copies of changes for technical review. That parallel review has a good chance of success if specifications and criteria are baselined for one vehicle and changes are processed for subsequent vehicles as additions or deletions to the baselined documents. In a meeting, December 14, with KSC/IO/R&DO and the contractors, there was general agreement that both the new procedure and baselining the specifications and criteria would result in a sound and timely system. Baselining is still under review by elements of IO, and we hope the matter will be resolved in a week or two. ✓

NOTES 12/19/66 GEISSLER

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12/21 9:15

1. Proposal for Measuring D-Region of the Ionosphere: Personnel of the Aerophysics Division and Aerospace Environment Division in conjunction with SSL and ASTR are investigating and evaluating a Raytheon proposal for a Mother-Daughter Satellite pair capable of measuring the electron content and constituents of the ionosphere. The concept proposed by Dr. Ken Davies, of ITSA, at the ESSA meeting you attended on December 15, 1966, involved mass spectrometric measurements of the D-region. Personnel of our laboratory have investigated rocket-launched mass spectrometric investigations of the ionosphere above the D-region. Problems associated with measurements in the D-region (70-90 km) are similar, but more severe than those of the higher altitude. The organizations that are involved in our measurement program at the higher altitudes have the capability of extending our investigations to lower altitudes (below 120 km). We believe a program can be developed to perform the experiment as outlined by Dr. Davies, but it will not be simple. Dr. Davies is forwarding a copy of his proposed experiment for our evaluation. We will follow through on this program (including contacting OSSA), and keep you informed. ✓

2. Unmanned Mars Surface Sample Return Mission: On request from Mr. E. Z. Gray's office, Mr. Thomae attended a meeting in Washington on Monday, Dec. 12, with Dr. Dixon (OMSF), Mr. Don Hearth and Pitt Thome (OSSA), to discuss the feasibility of an unmanned Mars surface sample return mission to be launched on a three-stage Saturn V in 1975. A study had been conducted by JPL and LeRC through OSSA upon inquiry by Dr. Seamans some 4 months ago, and was to be presented by Dr. Newell and Mr. Cortright to the Space Science Board on December 16, 1966. The study left the impression of still being superficial. Principally, OSSA recommends a mode of the double close-Hohmann transfer class (980 days total mission time with 325 days of staytime at Mars with spacecraft rendezvous in Mars orbit, total returned weight at earth re-entry of 50-55 lbs. Preliminary scrutiny of velocity assumptions shows absence of flight mechanics reserves; propulsion prerequisites are uncommonly sophisticated (oxygen-diflouride/diborane liquid propellants with 400 sec specific impulse). No Mars corridor requirements on guidance and flight control, no subsystems lifetime requirements, no considerations to rendezvous in Mars orbit from orbit determination and orbital matching viewpoint have been established. The last of the four modes analyzed by OSSA is based on a Venus swingby during return in order to reduce stay and total mission time. We had agreed to check the velocities employed and weights and propulsion assumptions, and furnish comments to Dr. Dixon when we have some decent engineering data to offer. We are planning to spend one or two man-months to analyze the proposed mission further; indications are that more realistic mission profiles in that time period exist that would result in 500 lbs of total returned weight if full advantage of the Saturn V capability is made. ✓

NOTES 12-19-66 GRAU

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1. S-IC-2 STAGE: Three engine cables must be replaced and several repaired on the S-IC-2 stage. Manufacturing Engineering Laboratory will also incorporate a number of changes on the stage in order to reduce the work required at KSC. Since this work is not yet defined, we have not been able to establish our requirements for test time. It is expected that work definition will be established and a revised S-IC-2 schedule issued this week. ✓

2. H-1 ENGINES: As I reported in the NOTES of last week, several methods were proposed to prevent recurrence of the problem we have had with turbine wheel blades. Two proposed controls for preventing materials mixing at Haynes Stellite which met with general approval were: (1) Haynes would perform a chemical and mechanical properties analysis on each group of blades poured. The sample would be taken from the mold risers with heat code and pour lot numbers incorporated; and (2) a "standard" blade would be X-rayed with each group of blades for density comparison. Rocketdyne's sampling procedure for acceptance of blades had required chemical analysis of one blade and microstructure analysis of three blades from each heat lot of blades, regardless of lot size. The fallacy of this procedure was the term "heat lot" which was defined as the heat at which the raw material was formed and had nothing to do with the heat at which the blades were cast. This procedure could allow thousands of blades to be shipped to Rocketdyne with only four to be sampled. During the interim period of revising their receiving inspection and sampling plan for our approval, Rocketdyne has implemented a 100% hardness check on all blades. Additionally, Rocketdyne Quality Control and the Government agency at Rocketdyne have been requested to immediately review all sampling plans and inspection procedures to determine if any deficiencies exist outside the turbine wheel area. Of primary concern is the possibility of foreign objects entering components or the engines and not being detected, as it was thought that the teflon in Engine 7080 had done. Rocketdyne Quality Control, Neosho, has begun investigations in an attempt to find any "loopholes" that may exist from the component area through static firing, acceptance, and shipping. ✓

3. SPACE CRAFT INC. QUALITY SURVEY: A recent quality survey of Space Craft Incorporated revealed a general improvement in the quality program as compared with the survey of November 1965. Most notable was the refinement of management procedures and controls. Significant discrepancies were the use of ultrasonic cleaner on potted modules and evidence of lax drawing and specification control. Corrective action has been initiated on both of these discrepancies, as well as on other lesser problems which were found. ✓

NOTES 12/19/66 HAEUSSERMANN

12/21 OK B 12/23

3-AXIS SIMULATOR FOR ATM: You recently raised a question concerning the source of funds for the ATM pointing control system simulator. The intended source of funds is budget category 946-ATM from NASA Headquarters. The proposed procurement has been approved by Headquarters. Contractor's proposals are due in on 12/19/66. Although the specifications are written around the ATM requirements, the simulator will have a certain flexibility which will allow its application to other space vehicle stabilization problems. ✓

ATM MOCK-UP MODEL: The Hayes Corporation has been selected to fabricate and assemble the mock-up model of the ATM. Drawings are being forwarded to Hayes via the ME Laboratory. Most of the drawings originating within Astrionics have been delivered or a delivery date committed which will allow the 1/15 schedule to be met. In some instances, models instead of drawings will be delivered. ✓

ESTIMATED COST INCREASE OF ATM, EXCLUSION OF EXPERIMENTS: The estimated cost of ATM (not including the experiments) has increased by approximately $9.0 million due to the cluster and better system definition. The major contributors to the additional cost are:

	(Cost in Thousands)
1. Fine Gimbal	2,500
2. Additional Rate Sensors	700
3. Addition of Star Seeker	800
4. Increase of Solar Array & Batteries	3,000
5. Addition of TM Station & Special Multiplexer	700
6. Additional Measuring Equipment	500
7. Television and Antenna Systems	200
8. Thermal Control System	300
9. Solar Sensors	300
	9,000

ATM: A preliminary design and analysis have been completed of an electrical subsystem for ATM which can provide an average of 3300 watts during the daylight portion of the orbit with a corresponding load of 1930 watts during the dark portion. Stated differently, this design can provide an average of 2540 watts on a continuous basis day and night. Prior to committing ourselves to a design, a resurvey of all ATM electrical loads is being conducted which will form the basis for a firm decision this week. A load of 600 watts which has been assumed for the LM is critical to this decision. The LM assumption cannot be verified until engineering liaison channels with MSC are identified and established. The promised first meeting continues to get postponed by MSC. ✓

[Dr. Robert C. Duncan, Chief, of MSC's Guidance & Navigation Division, will transfer to ERC to accept the position of Director, Guidance & Control. This position was occupied by Dr. Langford, who returns to industry. Colonel Duffey (Air Force) is considering the MSC position vacated by Dr. Duncan.]

NOTES 12/19/66 HEIMBURG
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F-1

The Parker S-IC lox vent valve was installed on the West Area F-1 Test Stand and a component checkout test (with lox tanked) will be conducted on December 20, 1966. Engine testing will resume after the holidays.

S-IVB (MSFC)

Test S-IVB-040 was conducted at the S-IVB Test Stand for a duration of 2.15 seconds. Intended duration was 200 seconds, however, the test was cut off by the GG overtemperature cutoff device when the GG overtemp measurement failed. Test S-IVB-041 is planned for Tuesday, December 20, 1966. The test will be for approximately 150 seconds with a restart approximately two hours later.

POWER PLANT TEST STAND

Cold flow tests have been conducted at the Power Plant Test Stand on the S-IB stage lox prevalve and suction duct. Similar tests with fuel have been conducted with the fuel prevalve. The data is being evaluated for a prevalve shutdown test utilizing a single H-1 engine. The test is tentatively scheduled for Wednesday, December 21, 1966.

SATURN V AUXILIARY DAMPER ARM

On December 15, 1966, Test Laboratory received a request from P&VE to perform the test program on the Auxiliary Damper Arm System. P&VE requested that the test program be completed to meet a shipping date of January 30, 1967, to KSC. As it was previously planned that the P&VE Structures Division perform these tests, it will not be possible to pick up the program at this late date and complete it by January 30, 1967. It does appear that we could complete a simplified (minimum) test program by the latter part of February. We are working on this with P&VE.

SATURN V SERVICE ARMS

On December 16, 1966, Dr. Debus directed that 501 Arms 4,5, and 6 (S-II Intermediate, S-II Fwd., and S-IVB Aft) should be modified to the lanyard withdrawal system (eliminate Harpoon gun) as was recently done to Arm 7 (S-IVB Aft). This will make all in-flight service arms a lanyard system. We believe decision is good, however, at this late date conversion could have major program impact. KSC plan is to update third set of arms going into test with this change and ship mod kits to the Cape for installation and verification in 501 hardware. Design will be performed locally by Boeing/ BECO with C. Herold of KSC as technical director of the effort. We will work with KSC and IO to implement this decision and minimize program impact.

NOTES 12-19-66 HOELZER

12/21/66

1. INSTALLATION OF TELEMETRY TRANSMITTER: A ground-type telemetry transmitter has been installed at the Weeden Mountain site and is being used as the primary radio frequency source for Time and Frequency Standards. Originated at the Computation Laboratory, data is multiplexed on IRIG Channels and fed to the Weeden Mountain transmitter via microwave link. Automatic switchover to the Computation Laboratory's emergency transmitter is affected if failure occurs.

Advantage: Excellent RF coverage of Huntsville area for continuous time frequency broadcasts.

2. THIRD GENERATION COMPUTER MANAGEMENT PRESENTATIONS:

Management presentations are being given to all laboratories and offices of the Center. These presentations cover the Third Generation concept, plans for implementation, and description of the UNIVAC 1108. So far, 18 presentations have been made. These include nine to the R&D laboratories and offices, three to the Industrial Operations offices, and six to the Staff offices.

3. THIRD GENERATION COMPUTER PREPARATION:

Coordination in Third Generation planning continues with Slidell in an effort to insure compatibility between the two systems and avoid unnecessary duplication of effort. A major area of activity in the past month has been to give preliminary definition for accounting and analysis procedures for the two installations.

NOTES 12/19/66 JAMES
12/21 9CA

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S-IVB ORBITAL WORKSHOP: Further testing on fire retardant materials at Tullahoma on three foot test samples has been accomplished. Dynatherm with scrim, which was reported on so favorably to you last week, showed poor results later in the week. Test analysis is being conducted at P&VE. To prevent further delay in the eight foot test tank program at DAC, authorization has been given to initiate testing with two materials, aluminum foil and dynatherm, at SACTO.

With respect to the workshop mission, it appears that the requirements for rendezvous and passivation are requiring more S-IVB APS propellant than is available (75 pounts required versus 60 pounds available). We will keep the AAP office tied in closely on this one.

S-IB VALVE CASTING PROBLEM: CCSD has (by letter dated 11/18/66) requested a waiver which would permit the use of certain valve castings from Parker with defects known as cold shut. In investigating this request for waiver, we get such comments as the defect doesn't spread and is usually confined to surface area. The problem is that, to date, no device has been used by either MSFC or CCSD which can establish the depth of the flaw. It is possible that Southwestern Industries has such a device and we are making plans to visit them with a questionable casting to test the capability of the device. We are continuing the investigation. This will come up at the DCR Board meeting Wednesday.

FOLLOW-ON PROCUREMENT CONTRACTS: We have learned from Headquarters that the S-IVB follow-on contract has been signed off by legal and final approval should be given today. Legal raised only one question on the S-IB contract. This concerned the "Directed Changes Clause" which was added to the contract. The question was immediately resolved by Michoud and we expect approval this week also.

NOTES 12-19-66 JOHNSON

12/21 JGS

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No significant items to report.

NOTES 12-19-66 KUERS

12/21 9PS

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Merry Christmas.

NOTES 12-19-66 LUCAS

12/21 9A-3

B 12/23

1. S-IC - S-II INTERSTAGE: The interface specimen failed at approximately 127% of limit S-IC cut-off loading condition during structural verification testing. The purpose of the test was to demonstrate the capability of the S-II interstage to withstand 130% of limit design loading. The failure condition represented the most critical flight loading which will be experienced. Heat was applied to the specimen to simulate the flight environment. The failure is obviously a local crippling situation. The test performance was good; therefore, the test results appear to be valid.

2. S-II LH_2 FEED LINE ELBOW: The structural verification test of the S-II contingency LH_2 feed line elbow (321 stainless steel) was completed at MSFC on December 9. The elbow withstood a hydrostatic pressure which yields a factor of safety of 1.31.

3. S-II FUEL TANK PRESSURE: The fuel tank pressure reduction for S-II-2 by 3 psi, required to provide an adequate margin of safety, will be accomplished. The impact of the reduction is being assessed.

4. AEDC TEST PROGRAM: (a) A LOX recirculation test was conducted by opening the prevalves and allowing LOX to recirculate naturally as the S-II stage operates. Results of this test were satisfactory, thus making it possible to conduct S-II simulation tests in the future. (b) A 30-second hot firing was conducted with 25 seconds being at maximum mixture ratio. This test was a simulated Saturn V first burn utilizing a one-second fuel lead. Thrust chamber temperature at engine start was on the lower side of the predicted temperature band for S-IVB/500 series first burn flights. (c) The next test was attempted after a 30-minute hold in order to obtain turbine exhaust temperatures similar to S-IVB/203 data after one orbit. Other conditions at engine start were identical to a previous successful test which had been conducted with a 4.5 second fuel lead. The test was terminated at 0.93 seconds when the gas generator overtemp device was activated.

5. C-1 ENGINE: The first firing of a C-1 Engine at MSFC was conducted on Thursday, December 15. It was fired for approximately 50 seconds and is the first in a series of tests to investigate potential problem areas. After the single engine program, three C-1 engines will be employed in an S-IVB/V APS module in order to establish performance levels in an actual system.

6. ORBITAL WORKSHOP: Every effort is being made to expedite the Orbital Workshop; mockup of the crew quarters is inside the existing S-IVB Stage at ME Laboratory. A work request has been issued, and all available drawings and sketches furnished to establish definition and configuration. The S-IVB Stage will be mounted in a vertical position and equipped with such hardware as thermal curtains, lunar floor (flat), ceiling, partitions, etc. We are working to have as many experiments deployed as possible by mid-January for the OSSA Senior Council members' visit.

7. CLUSTER: The preliminary results of a composite mission weight analysis show that payload requirements are weight compatible with launch vehicle capability for three of the four SAA flights. The weight analysis for the re-supply module flight (SAA #3) indicates a deficit in payload capability of approximately 2,000 pounds. Resolution of this deficit is under investigation through design improvement of the re-supply module, or by reallocation of re-supply module portions to the LM/ATM or workshop flights.

B 12/23

NOTES 12/19/66 MAUS
12/21 OS

FY-68 FUNDING - Informal information from reliable sources indicates that the NASA position to be presented to the President for FY 68 is $5.110 Billion and includes $300 M for AAP. We have, thus far, been unable to obtain any further details.

We understand that Mr. Webb and Mr. Schultz of BOB are at the ranch today (Dec 19) discussing the FY 68 Budget with the President.

NOTES 12/19/66 RICHARD

12/21 RB

Systems Engineering Review: R&D Operations will present a Systems Engineering Review on Jan. 26, 1967. This has two purposes: (1) to provide better visibility to all concerned about the launch vehicle systems area, and (2) to reduce and eliminate where possible the "piecemeal" systems presentations from stage reviews.

We feel that providing a "home" for system matters will allow the stage reviews to concentrate on stage problems strictly and at the same time allow a more complete and comprehensive view of overall system problems. The result should mean greater efficiency in the utilization of our expert manpower and cut down the average required meeting attendance of our technical people. Dr. Speer will also contribute to this review to cover his portion of the overall system.

The January meeting will cover Saturn V (primarily AS-501) with emphasis on latest developments. We plan to cover known system constraints and limitations, wherever we can.

B 12/23

NOTES 12/19/66 RUDOLPH

12/21 9AS

1. S-IC/S-II Interface Test Structural Failure:

- The S-IC/S-II Interface Structural Verification Test Program was performed by the Boeing Company under the SE&IS Contract.
- The test specimen included the S-IC/S-II Interstage (SA-504 light weight design) and the forward skirt portion of the S-IC Stage.
- On Thursday, 15 December 66, the test specimen was subjected to symmetrical axial loads with heat applied (200° to outside stringers - cooled to approximately 100° on inside ring frames).
- The Interstage structure failed at approximately three (3) feet forward of the S-IC/S-II Interface joint at approximately 127% limit load. ✓
- Preliminary review indicates satisfactory data was obtained. ✓

2. S-II-1 Stage - Second (2nd) acceptance firing now forecast for ~~Saturday~~ Friday, 23 December 66, at MTF. ✓

A complete S-II Stage Project status report will be included in my presentation at the MCM on Tuesday, 20 December 66. ✓

3. Apollo Program Press Symposium - Houston sponsored a 2-day "Press Symposium" on Thursday and Friday, 15 & 16 December 66, on the Apollo Program with emphasis on the AS-204 flight. As reported in the weekend press - Dr. Shea presented a frank coverage of some of the Apollo problems, showing pictures of the damaged hardware. Mr. Bramlet discussed, in an hour session, the Saturn V status, also emphasizing the lack of maturity in many specific hardware areas. Most questions were on the S-II Stage. These were answered frankly with some hedging with regard to finite schedules. ✓

NOTES 12/19/66 SPEER B 12/23
12/21 PS

1. GOSS CONFIGURATION CONTROL BOARD: Mission Operations, MSF has sent a proposal for a GOSS (Ground Operational Support System) Configuration Management System to MSFC for review. MSFC comments are being prepared and due to MSF by January 3, 1967. The purpose of this proposal is to establish internal operating procedures to be employed by the Office of Manned Space Flight, its three field centers; the Office of Tracking and Data Acquisition (OTDA) and Goddard Space Flight Center for accomplishing configuration management of GOSS. GOSS change requests are to be reviewed, coordinated, approved, and controlled at a management level commensurate with the potential impact on program performance, schedule and cost. The proposed control is similar to that presently applied to vehicle configuration management.

2. FUNDING STATUS OF LIEF/HOSC: We have received a request from Headquarters to give special visibility of the LIEF/HOSC funding situation (past, present, and future) in the next POP submission 67-1. We have also been requested to brief Mr. Christensen on the existing and planned configuration of the HOSC facility and equipment. Prior to giving that presentation to Headquarters, a briefing for Gen. O'Connor is scheduled on 1/4/67.

3. LIEF SYSTEMS INFORMATION LIBRARY: We have conducted a review of the LIEF Systems Information Library (SIL). We are attempting to provide in this library key information to facilitate real time problem identification, understanding, and solution during LIEF operations. This includes special system schematics, background information on potential problem areas and mission rules, and basic mission design data. We still rely, of course, on each support engineer for detailed knowledge in his cognizant area. The SIL provides a hard core of information prepared specially to facilitate group display and real time discussion, and has been a recognized need during operations to date. We will have substantial improvement in the SIL for 204. We are developing a scheme to insure full pre-launch coordination of this material with the Program Office, R&DO, and prime contractors to insure proper content and validity.

4. VOYAGER GROUND COMMANDS: An interim MSFC position on ground commands for the Voyager has been established. This position is that no requirements for specific ground commands have been identified and no capability shall be provided at this time. This position will be subject to continuing review as mission planning proceeds. R-ASTR and R-AERO are now jointly analyzing certain aspects of the mission to determine if the interim position should be revised to provide commands covering any of the following cases: (1) Low L/V performance; (2) guidance error; or (3) functional failures.

NOTES 12-19-66 Stuhlinger

B 12/23

12/21 QTS

1. LUNAR LANDING SITE: The Apollo Site Selection Board, of which I am a member, discussed possible lunar landing sites in a meeting last week. The site must lie within a rectangle bounded by $\pm 45^{o}$ longitude and $\pm 5^{o}$ latitude. Each site contains a set of possible landing spots whose spread is dictated by the desired width of the launch window. Lunar Orbiter I and II provided extremely valuable pictures of sites in the northern hemisphere (0 to $+5^{o}$ latitude); it is expected that at least one of the remaining orbiters will provide pictures of sites on the southern hemisphere. Selection criteria are (in priority order) (1) smoothness of surface at landing spot; (2) smoothness of terrain over which radar altitude measurements must be made during approach; (3) scientific interest of site. Several possible sites have been identified. ✓

2. EMR: Previous MSFC support of EMR experimenters (ORNL, NRL and University of Arizona) has provided enough experiment definition, including feasibility assurance, to permit continuation of EMR planning without further fund allocation to experimenters until the EMR project is formally initiated (hopefully in FY 1968). Further support of inhouse work (RP, Astr, P&VE, ME, Aero) is needed, though, to enable us to demonstrate feasibility and quickly activate the project when it is approved by OSSA. Agreements with all Laboratory directors concerned have been reached regarding the amount of work that can be done for EMR in view of work demands by Saturn, ATM, Voyager, and Thermo. ✓

3. HEAT PIPE EXPERIMENTS: Interest in the heat pipe is quickly increasing at many places. We learned from Dr. Grover, LASL, that several heat pipe experiments may be flown in the near future under Air Force auspices. ✓

4. PHOTOGRAPHIC MARS MISSION: Members of RPL, ASO, Aero, P&VE, and Auburn University made an advanced technology feasibility study of a solar-electric spacecraft, launched by an uprated Saturn I, which would be capable of photo-mapping of the complete Martian surface with Lunar Orbiter-quality picture transmission. This mission would complement and extend Voyager missions. The paper was cleared by OSSA for presentation at the AIAA meeting in January. May we give you a short presentation of the study at your convenience? → Yes, please B noted 12/16

5. SNAP 8: As we learned through ORNL, it was decided recently to re-design the mercury cycle of SNAP 8 from steel to tantalum. The reason is the steel-mercury corrosion problem. This will extend the SNAP 8 development by several more years. ✓

NOTES 12/19/66 WILLIAMS

12/21/66

1. Voyager: Luke Spears from this office is attending the meeting in Washington, with OSSA and other Centers, today, December 19.

We are establishing the Voyager organization in our Project Definition Office. In addition to Advanced Systems personnel, we are integrating IO and Tech Systems Office personnel into the Voyager group. The personnel presently identified include C. Chambers and A. Boyanton of IO and G. Turner of Tech Systems.

2. Space Station Seminar: A Space Station Seminar is being planned for January 31 - February 1 to educate all NASA Centers on space station activities and coordinate with them activities that are underway in the subsystems and the experiments areas. This seminar is scheduled for the Morris Auditorium and will be called by Headquarters (M. F. Markey, MTE).

3. LSSM: The LSSM Procurement Plan is in Mr. Buckner's hands. His people are re-analyzing it in preparation for discussion with Mr. Gorman next week. Mr. Buckner supports our intent to eliminate one of the two competing contractors.

4. Lunar Surface Missions: The final report of the MSF Committee, Tom Hanes, Chairman (Code MLA, Apollo Applications Office), on the Augmented Lunar Module, Shelter/Taxi has been reviewed by elements of ASO. Comments will be submitted to I-S/AA early next week.

5. The Synchronous Earth Orbital Mission Working Group: This group presented its preliminary findings to MSFC Management on December 9, 1966, and to the AAP Mission Planning Task Force on December 15. As a result of these presentations, MSF, MSFC, and MSC will review the work and some joint work is planned on the synchronous mission.

6. Saturn Improvement: Langley representatives Hugh Halliday and Bill Kinard (Project Manager) plan to visit MSFC in early January 1967 to discuss MSFC's possible participation in the Advanced Micrometeoroid Spacecraft (one Saturn IB launch in 1970 or 1971 and one Saturn V launch 6 to 9 months later) with particular emphasis on the payload shroud. Langley wants MSFC to accept the responsibility for developing and procuring the shroud. The contract for the micrometeoroid sensors is being negotiated now and the PAD approval is expected around January 1.

7. Orbital Missions Group: Plans have been made for a presentation of the EVA aspects of our proposed OSO satellite experiments to MSC on Tuesday, December 21, in Houston. Audience will include their EVA coordination group, selected astronauts (i.e., Buz Aldrin, Dick Gordon) and members of crew systems division.